25/3

"RED BOOKS" of the
BRITISH FIRE PREVENTION COMMITTEE.—No. 185.
Edited by the Executive.

FIRE TESTS
WITH
FIRE EXTINGUISHERS

SUPPLEMENTARY
EXPERIMENTAL TESTS
ON
PORTABLE
CHEMICAL FIRE EXTINGUISHERS

Particulars of Experimental Tests
and
Some Suggestions

ALL RIGHTS RESERVED

LONDON, 1914.

Published at the Offices of
THE BRITISH FIRE PREVENTION COMMITTEE
(Founded 1897—Incorporated 1899)
8 Waterloo Place, Pall Mall

K21065

22102347331

Med
K21065

f the
BRITISH FIRE PREVENTION COMMITTEE.—No. 185.

Edited by the Executive.

FIRE TESTS
WITH
FIRE EXTINGUISHERS

SUPPLEMENTARY
EXPERIMENTAL TESTS
ON
PORTABLE
CHEMICAL FIRE EXTINGUISHERS

Particulars of Experimental Tests
and
Some Suggestions

ALL RIGHTS RESERVED

LONDON, 1914.

Published at the Offices of
THE BRITISH FIRE PREVENTION COMMITTEE
(Founded 1897—Incorporated 1899)
8 Waterloo Place, Pall Mall

Two Shillings and Sixpence

OBJECTS OF THE COMMITTEE.

The main objects of the Committee are:

To direct attention to the urgent need for increased protection of life and property from fire by the adoption of preventive measures.

To use its influence in every direction towards minimizing the possibilities and dangers of fire.

To bring together those scientifically interested in the subject of Fire Prevention.

To arrange periodical meetings for the discussion of practical questions bearing on the same.

To establish a reading-room, library and collections for purposes of research, and for supplying recent and authentic information on the subject of Fire Prevention.

To publish from time to time papers specially prepared for the Committee, together with records, extracts, and translations.

To undertake such independent investigations and tests of materials, methods, and appliances as may be considered advisable.

The Committee's Reports on Tests with Materials, Methods of Construction, or Appliances are intended solely to state bare facts and occurrences, with tables, diagrams, or illustrations, and they are on no account to be read as expressions of opinion, criticisms, or comparisons.

The Committee is not responsible for the views of individual authors as expressed in Papers or Notes, but only for such observations as are formally issued on behalf of the Executive.

Similarly the Committee is not responsible for any translation or any summarized translation or explanation of its Reports in a foreign language, even if issued in conjunction with the official English version.

WELLC[illegible]
L[illegible]Y
Coll. we[illegible]Omec
Call
No.

COUNCIL.

Chairman of the Executive:

EDWIN O. SACHS, F.R.S.Ed., A.Inst.M.E., Archt., Vice-Pres. Int. Fire Service Council, etc.

Professor ARCHIBALD BARR, D.Sc., M.Inst.C.E., Glasgow University.
J. HIPPOLYTE BLANC, R.S.A., F.R.I.B.A.
Sir JOHN COCKBURN, K.C.M.G., M.D., late Premier of South Australia.
Sir W. MARTIN CONWAY, M.A., F.S.A.
Major A. McN. C. COOPER-KEY, Chief Insp. Explosives, Home Office.
Sir MAURICE FITZMAURICE, C.M.G., M.Inst.C.E., late Chief Engineer, London County Council.
Sir DOUGLAS FOX, J.P., Past-President, Institution of Civil Engineers.
R.-Adm J. de C. HAMILTON, M.V.O., late Chief Officer, London Fire Brigade.
W. T. HATCH, M.Inst.C.E., Chief Engineer, Metropolitan Asylums Board.
W. H. HUNTER, M.Inst.C.E., Consulting Engineer, Manchester Ship Canal.
Sir WILLIAM LINDLEY, M.Inst.C.E.
Rt. Hon. the Earl of LONDESBOROUGH, K.C.V.O., Member Int. Fire Service Council.
C. E. NOVERRE, J.P., late London Manager, Norwich Union Fire Office
Major W. O'MEARA, C.M.G., late Engineer-in-Chief, General Post Office.
Rt. Hon. Lord MONTAGU of BEAULIEU, J.P., V.D., D.L.
GUY PYM, J.P., D.L., late North British and Mercantile Insurance Company.
Col. Sir EDWARD RABAN, K.B., R.E., late Director of Works, Admiralty.
R. A. REDMAYNE, C.B., M.Sc., Chief Inspector of Mines, Home Office.
Sir BOVERTON REDWOOD, Bart., D.Sc., F.R.S.Ed., F.I.C., Adviser on Petroleum to the Home Office and the Admiralty.
W. E. RILEY, F.R.I.B.A., The Architect, London County Council.
ALEXANDER SIEMENS, Past President, Inst. of Civil Engineers.
W. SLINGO, Engineer-in-Chief, General Post Office.
Sir JAMES WEEKS SZLUMPER, M.Inst.C.E.
Sir HENRY TANNER, C.B., I.S.O., F.R.I.B.A., Principal Architect, H.M. Office of Works
Sir ASTON WEBB, C.V.O., C.B., R.A.
Sir ARTHUR WHITELEGGE, K.C.B., M.D., Chief Inspector of Factories, Home Office.
Sir JAMES WILLIAMSON, C.B., late Director of H.M. Dockyards.
Sir HENRY TRUEMAN WOOD, M.A. Secretary, Royal Society of Arts.

Executive:

MAX CLARKE, F.R.I.B.A., Member Int. Fire Service Council.
PERCY COLLINS, J.P., F.S.S., Member Int. Fire Service Council.
J. HERBERT DYER, Member Int. Fire Service Council.
J. W. RESTLER, M.Inst.C.E., Dept. Chief Eng. Metropolitan Water Board.
OSWALD C. WYLSON, F.R.I.B.A

Hon. Treasurer:

HORACE S. FOLKER, F.A.I., Member of Executive, Int. Fire Service Council.

Gen. Hon. Secretary:

ELLIS MARSLAND, District Surveyor, Joint Hon. Sec., Int. Fire Service Council.

Bankers:

COCKS, BIDDULPH & CO., Charing Cross, S.W.

Testing Station:

North Bank Lodge, Hanover Gate, Regent's Park, N.W.

Offices:

8 Waterloo Place, Pall Mall, London, S.W.

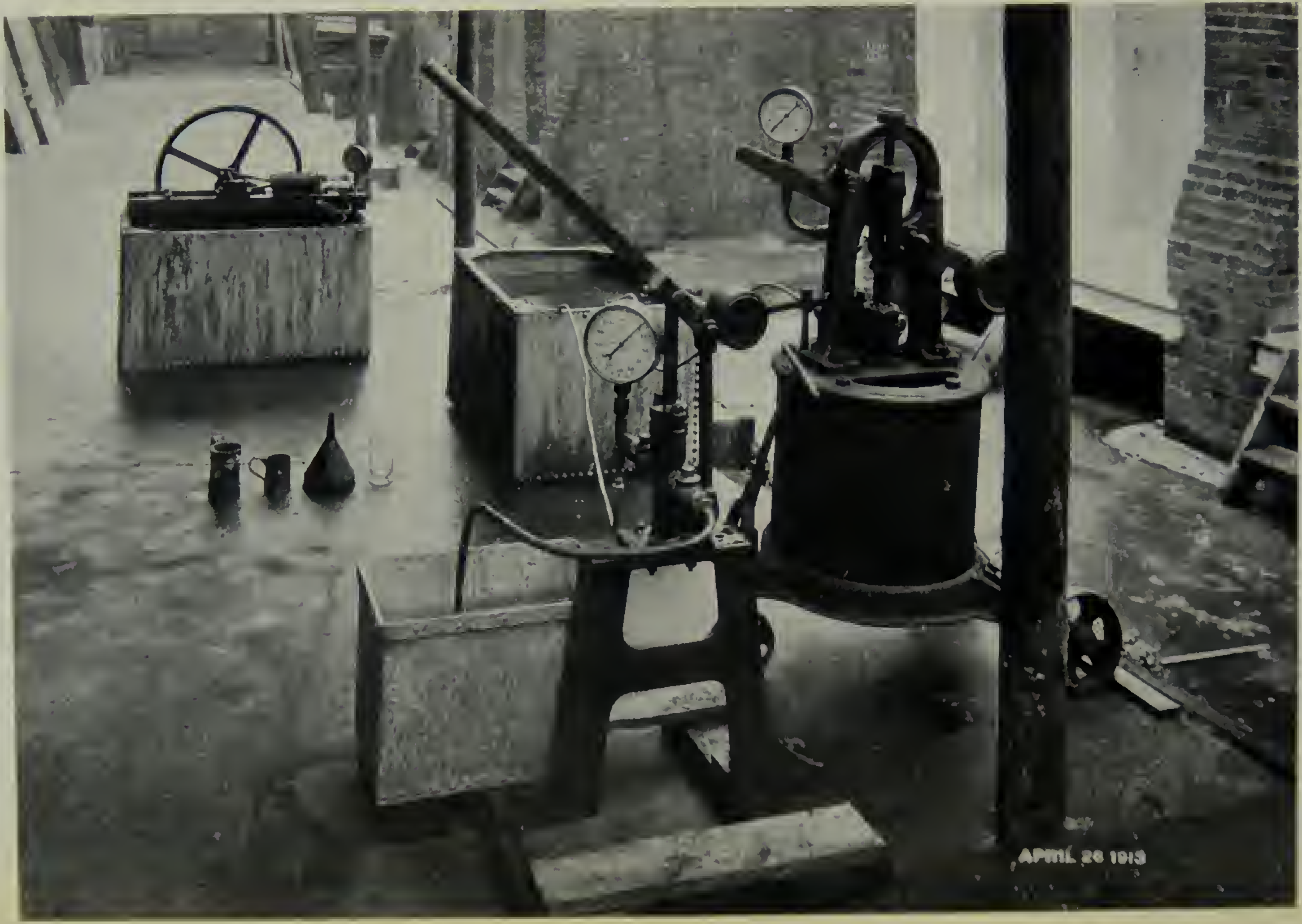


Fig. 1. SHOWING PLANT FOR MAKING AIR PRESSURE AND HYDRAULIC PRESSURE TESTS.

pag. 4.

NOTE

For some time past the Committee has felt the desirability of compiling comparative tables of the results of the various tests it has carried out on different Portable Fire Extinguishers, these comparative tables to be in a somewhat similar style to the Tables which the Committee has recently issued of the results of its tests on Doors and Floors.

In order to make these tables as complete as possible it was deemed advisable to undertake some further tests on the same appliances that had been under test previously. This Red Book is a record of these additional tests, which resulted in important and interesting information being obtained.

As a result of these tests and from inquiries made, the Committee feel it is now in a position to formulate a Standard for testing Portable Chemical Fire Extinguishers from a constructional standpoint. This Standard is in addition to the tests the Committee has employed during the last seven years for the purpose of ascertaining the efficiency or otherwise of the appliances in dealing with fires.

This Standard is set forth in Memorandum I.

The following facts have been carefully considered by the Committee when formulating the said Standard tests:

(a) The average pressure at which the 10 Extinguishers of different makes burst when under hydraulic pressure was 419 lbs. per sq. in. (*28·5 atmos.*), the maximum being 570 lbs. per sq. in. (*38·7 atmos.*), and the minimum 200 lbs. per sq. in. (*13·6 atmos.*)

(b) The average pressure to which 12 Extinguishers of different makes are *advertised* to be tested before being sold is 309 lbs. per sq. in. (*21 atmos.*).

(c) The Standard adopted by the National Fire Protection Association of the United States is 350 lbs. per sq. in. (*23·8 atmos.*). The use of steel is not permitted by that body.

(d) The average amount of air space provided (i.e. in addition to the usual charge of chemicals, etc.) in the same 10 Extinguishers tested was 10·8%, the maximum being 16·6% and the minimum 5·8%.

No controlling cocks are allowed by the American Association referred to above.

At the same time the Committee particularly wishes to emphasize the fact that it has abstained from demanding or recommending the inclusion of any specifically patented or other device used for the purpose of sale, although such feature may otherwise be advantageous.

A Memorandum (Memorandum II) has been added indicating some general observations of this Committee's Extinguisher Research Sub-Committee which should claim attention.

Further, the Extinguisher Research Sub-Committee has compiled a "Form of Details" in which the various points essential to ascertaining the construction, arrangements and general reliability of the apparatus can be set forth. This form, given in Appendix I, has been adopted by the Committee as its standard form.

A regrettable feature brought to the notice of the Committee by these tests was the difference found, after careful investigation, between the actual construction of some of the Extinguishers and that set forth in the detailed description of the appliances supplied by the makers for the original Red Books.

The Committee hopes to be able to issue the comparative Tables at an early date next year.

The Offices of the
British Fire Prevention Committee
8, Waterloo Place,
London, S.W.

For the Executive:
EDWIN O. SACHS,
Chairman.
ELLIS MARSLAND,
Gen. Hon. Secretary.

July, 1913.

N.B. This Red Book should be read in conjunction with Red Book No. 186, in course of preparation, which will deal with a series of tests with some 80 chemical fire extinguishers put at the Committee's disposal by public authorities and other subscribers to this body.

MEMORANDUM I.

STANDARD TEST

FOR

PORTABLE CHEMICAL FIRE EXTINGUISHERS.

Supplementary Constructional Test.

Extinguishers to be tested by Hydraulic Pressure to 350 lbs. per sq. in. (*23·8 atmos.*) for 5 minutes.

Note.—This Standard Test is in addition to the tests which the Committee has been and is using to ascertain the efficiency or otherwise of Portable Fire Extinguishers in dealing with actual fires.

Issued by Order of the Executive:
EDWIN O. SACHS, *Chairman.*
ELLIS MARSLAND, *Gen. Hon. Secretary.*

July, 1913.

MEMORANDUM II.

SOME SUGGESTIONS AS TO PORTABLE CHEMICAL FIRE EXTINGUISHERS.

The Tests recorded in Report No. 185 demonstrated that:

(a) Portable Fire Extinguishers require to be subjected to Hydraulic Pressure of at least 350 lbs. per square inch (*23·8 atmos.*) for 5 minutes by the manufacturers before being issued for use, in order that there may be little likelihood of the appliance bursting when being discharged, and should be so certified.

(b) All Portable Fire Extinguishers require the provision of a certain amount of air space—after being properly charged—to allow for the gas generated when the machine is operated and for the expansion of the liquids. The amount of this air space must be carefully proportioned to the amount of gas that the chemical charge can generate. Pending the carrying out of further tests and investigations by the Committee in this connection, a minimum space of 15% is deemed advisable for safety.

(c) The amounts of the chemicals used require to be accurately calculated and great care must be exercised when recharging the extinguishers that these amounts are not exceeded.

(d) When the Extinguishers were tested under Hydraulic Pressure to destruction, the joints at the collars $\frac{\text{and}}{\text{or}}$ shoulders of the domes or ends generally failed.

In addition to the above observations the Committee has also found as a result of these tests and the original fire tests that some further qualifications are essential and desirable in all extinguishers. Amongst these qualifications are the following:

1. The capacity of the extinguisher should not exceed 3 gallons (*13·63 litres*) as the combined weight of a charge of this quantity and the apparatus is approximately ½ cwt. (*25·4 kilos.*).
2. Some method must be provided to avoid an excess of liquid being put into the extinguisher when it is being charged so that the amount of air space (see observation "b" above) is not encroached upon. This should be accomplished by means of an overflow arrangement.
3. The provision of a small length of suitable hose attached to the outlet. In some appliances without such hose it is almost impossible to direct the jet of liquid on to the seat of the fire as if the extinguisher is not held in one particular position the gas escapes and consequently the greater part of the liquid is left undischarged.

For the Sub-Committee conducting the Tests:

July, 1913. D. W. WOOD, *Directing Member.*

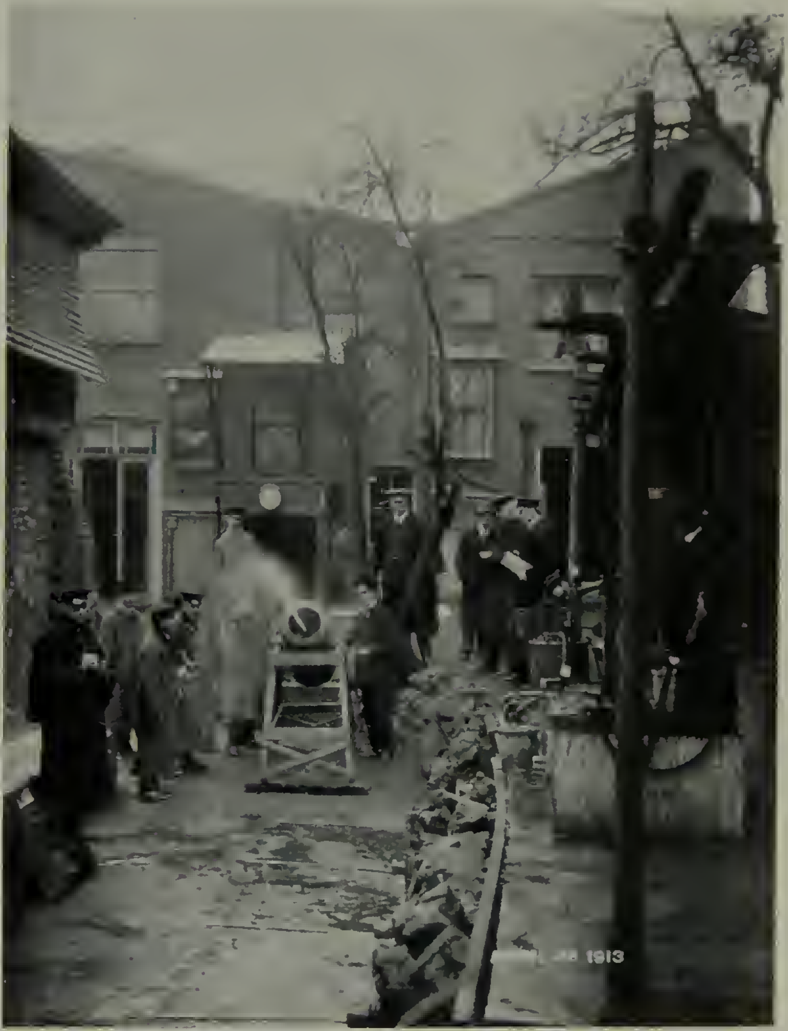


Fig. 4. EXTINGUISHER BEING DISCHARGED FROM PROTECTING SHELL.

page [illegible].

EXPERIMENTAL FIRE TESTS

CONDUCTED BY

THE EXECUTIVE

OF THE

British Fire Prevention Committee

[FOUNDED 1897—INCORPORATED 1899.]

TEST No. 185 (Series), APRIL 26th, 1913.

SUPPLEMENTARY EXPERIMENTAL TESTS
ON
PORTABLE CHEMICAL FIRE EXTINGUISHERS.

OBJECT OF TESTS.

(*With particulars of the Tests applied.*)

To ascertain the efficiency of those Portable Fire Extinguishers, which had previously been tested by the Committee, the new tests to deal with:

1. The range and duration of the jet of liquid discharged from the appliance some considerable time after charging.
2. The amount of liquid remaining in appliance after operation.
3. The result of the application of an air pressure test of 100 lbs. per sq. in. (*6·9 atmos.*) for five minutes.
4. The result of the application of Hydraulic Pressure Test of 350 lbs. per sq. in. (*23·8 atmos.*) for five minutes.
5. The hydraulic pressure at which the appliance burst and the effect of said pressure thereon.
6. The internal condition of the extinguisher after these tests.

SUMMARY OF RESULTS OF TESTS.

The following is a summary of the results of the tests:

The Range of the discharge of the liquid from the Extinguishers, when operated, does not appear to deteriorate much, although the appliances may have been left untouched for some years.

There is a wide difference between the relative strengths of the Extinguishers made by different makers. In some cases the margin of safety in the constructional strength is almost infinitesimal, as so much depends upon the quality and quantity of the chemicals employed.

The following table gives a summary of the results of the Tests ordered by the Committee on each Extinguisher.

Red Book No. of previous fire test.	No. of Extinguisher.	Capacity in pints.	Date Charged.	Range of Discharge in feet.		Duration of Discharge in Seconds.	Amount of Liquid undischarged.	Bursting Pressure. Hydraulic lbs. per sq. in ‡	Result of the Hydraulic Pressure Test
No.		pts.		ft.	ft.	sec.	oz.	lbs.	
121	No. 121 Z.	16	8. 2.07	15	25	60	*205 oz.	500	Pressed-end fractured and parted from conical vessel
	No. 121 Y.	16	8. 2.07	15	30	35	*240 oz.	—	
124	No. 124 Z.	24	15.10.07	25	30	90	2 oz.	550	A split ⅜ in. in length half way down. Bulged very much.
	No. 124 Y.	24	15.10.07	20	45	75	2 oz.	—	
126	No. 126 Z.	13½	27. 3.08	20	30	90	4 oz.	570	Collar blew out.
	No. 126 Y.	13½	27. 3.08	20	30	75	2 oz.	—	
134	No. 134 Z.	13	8.10.08	15	30	155	12 oz.	350	Failed at under side of pressed top.
	No. 134 Y.	9	8.10.08	15	30	60	4 oz.	—	
136	No. 136 Z.	18	8.10.08	10	30	160	68 oz.	560	Leaky at 350 lbs. Fracture ½ in. length about half way down.
	No. 136 Y.	*No Extinguisher available.*							
142	No. 142 Z.	17¾	14. 7.09	35	45	45	None.	560	Dome failed at beaded joint.
	No. 142 Y.	17¾	14. 7.09	25	35	50	½ oz.	—	
143	No. 143 Z.	25	28. 9.09	15	40	40	None.	350	Top dished-end parted from barrel. Barrel also split.
	No. 143 Y.	25	28.9.09	10	30	45	80 oz.	—	
152	No. 152 Z.	15½	2. 2.10	20	30	60	None.	200	Dished-end parted from cylinder.
	No. 152 Y.	*No Extinguisher available.*							
165†	No. 165 Z.	26	—. 1.12	25	30	115	8 oz.	200	Dished-end blew out at joint with cylinder.
	No. 165 Y.	*No Extinguisher available.*							
177	No. 177 Z	16	26. 9.12	10	30	40	None.	350	Cap blew out from dished-top.
	No. 177 Y.	16	26. 9.12	10	30	45	160 oz.	—	

Note.—Only the extinguishers of the Z series were tested to ascertain the Hydraulic Pressure required to burst them.

* *Note.*—As regards the amount of liquid undischarged from these two Extinguishers it should be noted that the construction of these appliances is such, that to be effective they must always be held when being operated with the handle on the *upper* side. In both tests Z and Y the extinguishers were fixed in the protecting shell with the handle on the *lower* side.

† *Note.*—The testors have applied for further official fire tests with an appliance of different construction, which tests will include the Committee's new Standard Supplementary Constructional Test, and will be dealt with in Red Book No. 184.

‡ *Note.*—14·7 lbs. per sq. in. = *1 atmos.*

The average pressure at which the 10 different makes of extinguishers burst when under Hydraulic Pressure was 419 lbs. per sq. in. (*28·5 atmos.*).

The average amount of air space provided (i.e. in addition to the usual charge of Chemicals, Liquids, etc.) in the same 10 machines was 10·8%.

PREPARATIONS FOR AND CONDUCT OF THE TESTS.

The tests were conducted at the Committee's Testing Station, North Bank, Regent's Park, on April 10th and 26th, 1913.

The meteorological observations at the Botanic Gardens, Regent's Park, read as follows:

On April 19th, 1913, the Barometer at 3 p.m. registered 29·26in. (*74·32c.m.*). The attached Thermometer 51·0° F. (*10·5° C.*). The wind was Westerly and the weather cloudy. The day was fine and windy.

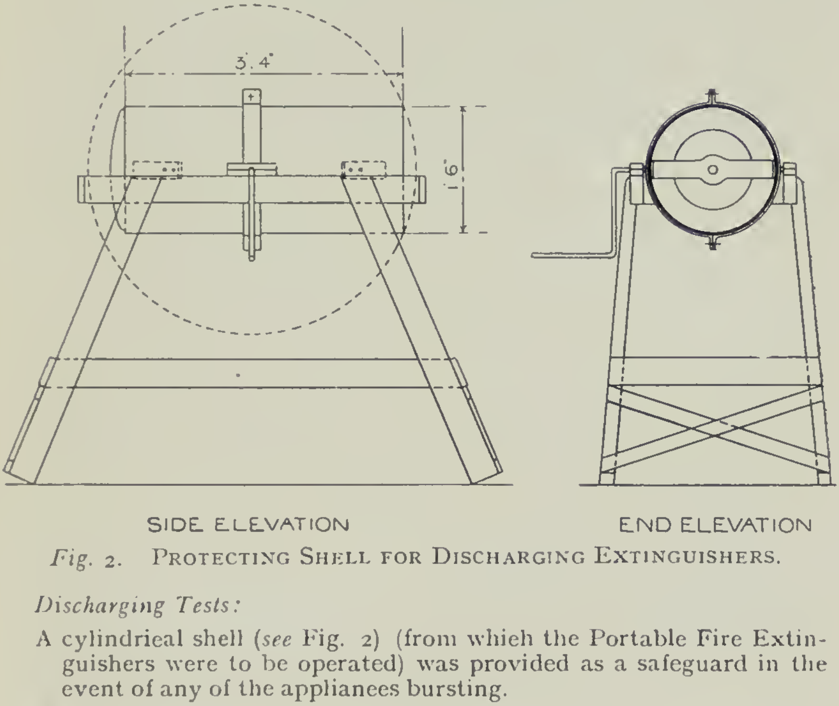
On April 26th, 1913, the Barometer at 3 p.m. registered 29·51in. (*74·95c.m.*). The attached Thermometer 53·0° F. (*11·7° C.*). The wind was Southerly and the weather overcast. The afternoon was dull and showery.

On April 26th the tests were commenced at 1.30 p.m.

All the tests were made and the Portable Fire Extinguishers operated by members of the Sub-Committee.

DESCRIPTION OF THE TESTING PLANT.

All the Tests were carried out in the open.



SIDE ELEVATION END ELEVATION

Fig. 2. Protecting Shell for Discharging Extinguishers.

Discharging Tests:

A cylindrical shell (*see* Fig. 2) (from which the Portable Fire Extinguishers were to be operated) was provided as a safeguard in the event of any of the appliances bursting.

Pressure Tests:

Air: An open galvanized iron tank containing water was provided. The tank was of sufficient size to allow the Portable Fire Extinguishers being immersed, and to this was attached a small air pump, pressure gauge and connections to the extinguishers.

Hydraulic: A similar tank of water and a hand operated hydraulic pump with pressure gauge and connections to the extinguishers were provided.

A larger pump was also kept in reserve in case of emergency.

These tanks and pumps are shown in Fig. 1 on page 4.

CONDUCT AND DETAILS OF TESTS.

The Portable Fire Extinguishers were divided into two series one of each make being marked with the Number of the Red Book relating to the previous tests on that particular appliance with the addition of the letter Z and another with a similar number and the letter Y.

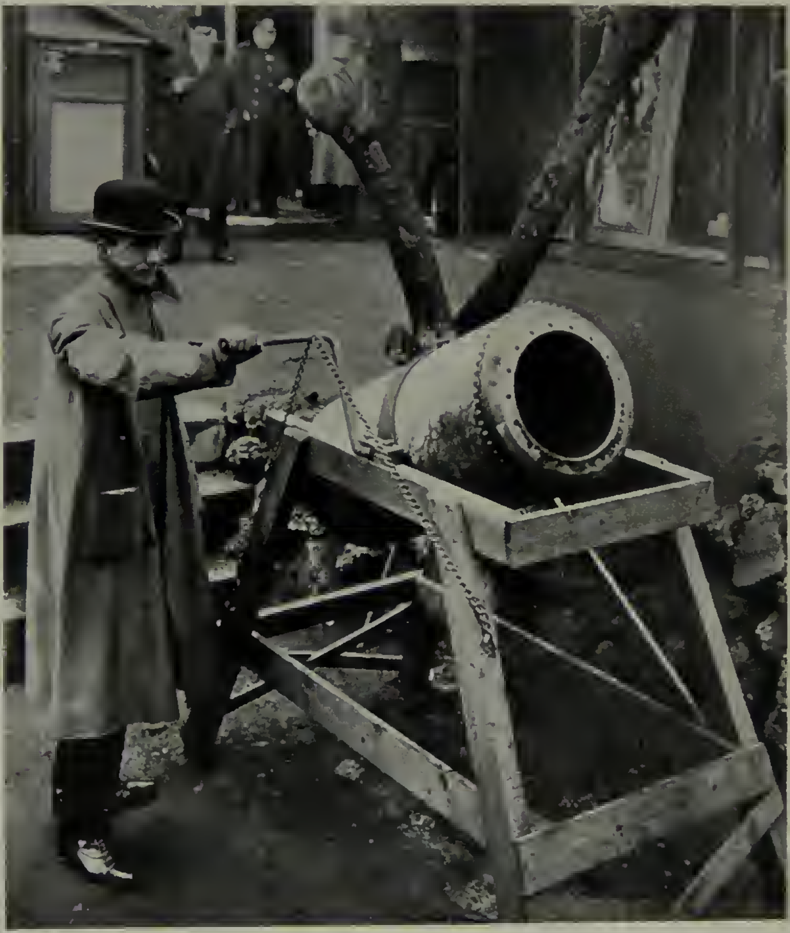


Fig. 3. PROTECTING SHELL FOR DISCHARGING EXTINGUISHERS.

On April 19th the extinguishers forming the Z series were discharged, the range and duration of the jet of liquid recorded, the liquid remaining in the appliance measured, and the general appearance of the apparatus noted.

All these extinguishers between the discharging on April 10th and the subsequent test on April 26th were fitted with uniform connections, and any relief valves, etc., were taken out and properly plugged.

On April 26th the same machines were tested under both air and hydraulic pressure, and subsequently were cut open in order that the interiors could be well examined.

Each appliance was separately immersed in a tank of water and connected to the air pump fitted with a pressure gauge and a pressure of 100 lbs. per sq. in. (*6·9 atmos.*) pumped into the extinguisher.

Note.—The air pump and its connections proved faulty—leaking at an approximate rate of 10 lbs. per sq. in. (*·69 atmos.*) per 5 secs.

After this test the extinguishers were almost filled with water and immersed in another tank and connected up to a hydraulic pump fitted with a gauge. A pressure of 350 lbs. per sq. in. (*23·8 atmos.*) was then pumped into the extinguisher and maintained for 5 minutes. At the expiry of 5 minutes the pressure was gradually increased until the extinguisher failed.

The tank had an overflow pipe which discharged into a measuring receptacle on the further side.

The larger hydraulic pump provided as a reserve was not used.

The temperature of the water in the tanks in which the extinguishers were immersed was from 49° to 51° F. (*9·4*° to *10·5*° *C.*).

On the same day the extinguishers forming the Y series were discharged, the range and duration of the jet of liquid recorded, the liquid remaining in the appliance measured, and the general appearance of the apparatus noted.

GENERAL ARRANGEMENTS.

The tests were carried out on April 26th, 1913, according to the procedure laid down by the Executive for investigations of this description, and were conducted by a Sub-Committee of the Executive comprising:

D. W. Wood (Insurance Surveyor). } *Joint*
Thos. R. Brooke. } *Directing*
C. T. Cuss (Loco. Dept., Gt. Western Rly.) } *Members.*
B. Franklin Adams, B.Sc.
F. W. Adams (Chief Officer, Hendon Fire Brigade).
J. W. Brooker (Hon. Chief Officer, Weybridge Fire Brigade).
William Grellier, F.R.I.B.A. (District Surveyor).
Lieut.-Col. Morland (Chief Officer, Abingdon Fire Brigade).
Stanley W. Thorpe (Superintendent, St Albans Fire Brigade).
J. W. Tinné, J.P.

The Council was represented for the testing operations on April 26th, 1913, by:

The Rt. Hon. The Earl of Londesborough, K.C.V.O.

The Executive was represented for the testing operations on April 26th, 1913, by:

Edwin O. Sachs, F.R.S.Ed., *Chairman.*
Horace S. Folker, F.A.I., *Hon. Treasurer.*

The Committee's Hon. Medical Officer, Major R. J. Maitland-Coffin, F.R.C.P., was in attendance on April 26th, 1913.

The general body of members were represented on April 26th, 1913. by: S. G. Gamble, F.S.I.,A.M.Inst.C.E. (Divisional Officer London Fire Brigade); Chas. J. Kirk (Chief Officer, New Malden Fire Brigade); and E. Boyce Podmore.

The members of the Sub-Committee conducting the tests on April 19th comprised: D. W. Wood, Thos. R. Brooke, and C. T. Cuss, *Joint Directing Members.*

(Signed)
For the Sub-Committee conducting the Test:
D. W. WOOD.

For the General Testing Arrangements Sub-Committee:
J. HERBERT DYER.

For the Executive:
EDWIN O. SACHS.

Published by the Committee as directed by the Executive.	Verified a true copy of the Report ordered to be published.
HORACE S. FOLKER (*Hon. Treasurer*).	SPENCER, GIBSON & SON (*Solicitors*).
Date—August 27th, 1913.	*Date—December 31st*, 1913.

Lists of the Committee's Publications, etc., are obtainable upon application to the Assistant Secretary, 8, Waterloo Place, Pall Mall, London, S.W.

APPENDIX I.

BRITISH FIRE PREVENTION COMMITTEE

(FOUNDED 1897—INCORPORATED 1899.)

PORTABLE CHEMICAL FIRE EXTINGUISHERS.

FORM OF DETAILS.

1. *RED BOOK NO.*
2. *NAME OF EXTINGUISHER*
3. *Makers' Class No.*
4. *MAKERS*
5. *DATE CHARGED*
6. *TYPE* (i.e. Alkali-Acid, CO. Cartridge, Compressed Air, etc.)
7. *METHOD OF OPERATING*
8. *CAPACITY* reputed
9. ,, *gross*
10. ,, when properly filled
11. *RESIDUE* in *liquid ozs.* after test
12. *WEIGHT charged*
13. ,, *empty*
14. *MEASUREMENT height.*
15. ,, *diameter*

DESCRIPTION.

SHELL.

16. Shape
17. Ends
18. Metal
19. Gauge (thickness)
20. Coated inside with
21. Coated outside with
22. Seams—side, kind
23. Spacing of Rivets
24. Seams—end, kind
25. Spacing of Rivets
26. Interior—can it be easily seen for examination
27. Condition
28. Testing—to what pressure has the extinguisher been tested by makers
29. Result of hydraulic pressure of 350 lbs. per square in. for 5 minutes.
30. Expansion volume of vessel
31. If pressure continued beyond 350 lbs. per square in. for 5 minutes what pressure burst the appliance
32. Filling—what overflow arrangement provided to prevent overfilling
33. Air space—amount left for expansion of liquid, &c. (i.e. percentage of total internal volume)

COLLAR.

34. Metal
35. How fixed to shell

CAP.

36. Metal
37. How fixed to collar
38. If screw—number of threads and pitch.

OUTLET—EXTERNAL.

39. Metal
40. Method of attachment
41. Size of bore

OUTLET STRAINER.

42. Metal
43. Coated with
44. Position and description
45. Size of bore

OUTLET—INTERNAL

46. Metal
47. Coated with
48. Position and description

p. 15.

HOSE.
49. Material
50. Armoured
51. Length
52. Method of attachment
53. Size of bore
54. Pressure test
55. Kinking
56. Condition

NOZZLE.
57. Metal
58. Size of bore
59. Rubber cap
60. Condition—clogged, &c.

PLUNGER.
61. Stuffing box material
62. Packing material
63. Material
64. Spring material
65. Means to prevent accidental operation

HANDLES.
66. Number
67. Position
68. Material
69. Method of attachment

STRAPS.
70. Material
71. Position
72. Use

SAFETY VALVE.
73. Material
74. Control
75. Set at
76. Position
77. Condition

CONTROL COCKS or VALVES.
78. Material
79. Type
80. Position
81. Condition

JOINTS or WASHERS.
82. Position
83. Material
84. Thickness
85. Condition

CHEMICALS.
ALKALI-ACID TYPE.
86. *ACID* used
87. Quantity-weight
88. Specific gravity

Container
89. Material
90. How sealed
91. Stopper-kind
92. Stopper material
93. Capacity
94. Filling line—how marked

CAGE.
95. Material
96. Coated with
97. Strainer
98. Will acid readily spill or shake out
99. *ALKALI* or salt used
100. Quantity—weight
101. Container

CO_2 TYPE.
CARTRIDGE.
102. Material
103. Seal
104. Pressure test
105. Capacity
106. Position
107. How operated

CHEMICALS—OTHERS
108 Full particulars

COMPRESSED AIR.—
109. Full particulars

DIRECTIONS for OPERATING.
110. Position on machine

DIRECTIONS for RE-CHARGING.
111. Position on Machine
112. *RANGE OF HORIZONTAL JET*
113. Duration
114. *RANGE OF VERTICAL JET*

RE-CHARGING.
115. Materials—how supplied
116. New parts required
117. Screws, &c., to be adjusted
118. *ANTI-FREEZING* mixture used—material
119. Quantity
120. *TAMPERING*—any device to indicate.
121. *CORROSION*—brief report.
122. *BURSTING* pressure test—details
123. *DATE* of filling in form.

MEMORANDA.

WELLCOME LIBRARY INSTITUTE